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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**  
**BEFORE THE BOARD OF PATENT APPEALS AND**  
**INTERFERENCES**

In re application of:	)	
	)	
Yukio MORISHIGE et al.	)	
	)	Group Art Unit: 1763
Serial No.: 09/981,712	)	
	)	Examiner: Parviz Hassanzadeh
Filed: October 19, 2001	)	
	)	Attorney Docket: 016778/0437
For: METHOD AND DEVICE	)	
FOR CORRECTING	)	
PATTERN FILM ON A	)	
SEMICONDUCTOR SUBSTRATE	)	

**APPELLANT'S BRIEF UNDER 37 C.F.R. 1.192**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

The following is the Appellant's Brief, submitted under the provisions of 37 C.F.R. 1.192. The fee of \$330 (large entity) required by 37 C.F.R. 1.17(c) is included in the accompanying check.

**1. Real Party in Interest**

The real party in interest is the assignee of record, NEC Corporation.

**2. Related Appeals and Interferences**

There are no related appeals or interferences that will directly affect, be directly affected by, or have a bearing on the present appeal, that are known to appellant or the appellant's patent representative.

**3. Status of Claims**

The present appeal is directed to claims 6-20, i.e., all of the presently pending claims in this application. Please note that claims 1-5 are withdrawn from consideration, and thus those claims are not on appeal.

**4. Status of Amendments**

Claims 1-12 were originally pending in the application. In response to a Restriction Requirement dated October 2, 2003, Appellant elected claims 6-12, with traverse. In response to a first substantive Office Action, Appellant amended claims 1, 6, 8-11, and added new claims 13-20. In response to a second, final Office Action, Appellant amended claims 6, 16 and 19, whereby the response to final Office Action was not entered for purposes of appeal (as

noted in an Advisory Action issued by the PTO). Amendment Accompanying an Appeal Brief is being filed concurrently herewith, in order to correct an obvious problem in the preamble of claim 19. All of the presently pending claims are rejected over cited art of record.

## **5. Summary of the Invention**

The present invention relates to a device for correcting pattern film on a semiconductor substrate.

Referring to Figure 1 of the drawings, a first laser source 1 provides laser light (e.g., Nd:YVO4 laser) for correcting black defects on a wafer, and a second laser source 2 provides laser light (e.g., laser CVD) for correcting white defects on the wafer. The wafer is held in a position whereby its surface that is to have its white and black defects corrected, is facing in a downward direction. A holder holds the wafer in the downward direction, by providing a sucking force for holding the wafer in place. Also, a gas window 5 for blowing material gas on the surface of the wafer is provided underneath the wafer (disposed between the laser sources and the wafer), which conducts laser light from the second laser source onto the surface of the wafer, in order to vaporize pattern film on the surface of the wafer (so as to remove the white defects).

The present invention, as recited in dependent claims 15-17 and 20, are directed to features of the gas window 5, as seen best in Figure 2 of the drawings.

## **6. Concise Statement Listing Each Ground of Rejection For Review**

The issues on appeal are whether the Examiner erred in rejecting claims 6 and 10-20 under 35 U.S.C. § 103(a) as being unpatentable over Morishige (JP 10-324973-A) in view of Ninomiya et al. (JP 61-279690-A) and Yoshino (JP 63-036249-A); and whether the Examiner erred in rejected claims 7-9 under 35 U.S.C. § 103(a) as being unpatentable over Morishige (JP 10-324973-A) in view of Ninomiya et al. (JP 61-279690-A) and Yoshino (JP 63-036249-A) and further in view of Okamoto (U.S. Patent No. 4,628,531).

## **7. Argument**

### A. Claims 6-12 and 14.

In its rejection of independent claim 6, the final Office Action asserted that Morishige teaches a holder 18, a laser irradiator 14, a gas window 10. The final Office Action admitted that Morishige failed to teach a holder for holding a substrate in a downward direction, and relied to Ninomiya for showing a wafer 4 held by a wafer holder 19 with its surface facing downward so that resultant reaction product does not fall on the surface of the wafer. The final Office Action further admitted that Morishige failed to teach a laser irradiator comprising first and second laser sources, and relied on Yoshino for teachings those features. As to the features of claims 7-9, the final Office Action relied on the teachings of Okamoto for teaching a pattern checking apparatus.

Morishige:

Morishige is directed to the suppression of accumulation of fallen and laid deposited particles and the prevention of the intrusion of air and to prevent deviation in a gas curtain even by a purge gas. An important aspect of the system of Morishige is the use of a laser CVD that corrects defects on the surface of a substrate. See, in particular, numbered paragraph 0002 and 0008 of Morishige.

As correctly recognized in the final Office Action, Morishige discloses that the substrate is disposed in an upwards-facing direction, and not in a downwards-facing direction.

Ninomiya:

Ninomiya is directed to the prevention of the falling and sticking of a resultant reaction product onto a surface to be treated and the staining of the surface with a surface treatment device, whereby a gaseous material is supplied in a vacuum treatment chamber 9 and laser light from a laser 16 is reflected by a mirror 12 and introduced into the chamber 9, such that the wafer is subjected to the surface treatment such as etching by the active particles formed by the excitation and dissociation of the gaseous raw material. The wafer 5 is positioned in a downwards-facing direction in the system of Ninomiya.

The aim of Ninomiya is to prevent piled-up crud from falling down on the surface of the wafer in the chamber 9, whereby this technique is useful when the wafer is surrounded by the inner walls of the chamber 9. See

Use/Advantage of Ninomiya, in the Abstract. However, unlike the present invention and unlike Morishige, Ninomiya does not relate to particles that are produced when an ion beam (e.g., a laser light source) is irradiated onto a wafer and directly falls down on the wafer without sticking to the walls surrounding the wafer. Thus, the reason for placing the wafer in a downwards-facing direction in Ninomiya is totally different from the reason for placing the wafer in a downwards-facing direction in the present invention.

Accordingly, one skilled in the art would not be motivated to combine the teachings of Ninomiya with those of Morishige, since the purpose for placing a substrate in a downwards-facing direction in Ninomiya is for reasons that do not exist in the system/method of Morishige, and which prevent problems from occurring that do not exist in the system/method of Morishige.

Furthermore, Ninomiya is not directed to dealing with defects due to laser light being irradiated on a wafer, and thus the system/method of Morishige, which uses laser light to correct defects on a wafer, would not turn to the teachings of Ninomiya for any reason.

Yoshino:

The final Office Action relied on the teachings of Yoshino to show the correction of black and white defects, whereby the correcting device included a laser irradiator which used a beam splitter to create two laser light beams to be provided onto a surface of a wafer.

Like Morishige, Yoshino discloses that the surface of the wafer is facing upwards.

Kawamura:

The Advisory Action, which addressed Remarks provided in a response to the final Office Action, stated that both Ninomiya and Kawamura (JP 5-259247-A) show a substrate facing downwards. As discussed above, Ninomiya is directed to a much different system, and thus is not combinable with Morishige and Yoshino.

Further, Kawamura is directed to the reduction of black defects on a solid-image pickup by carrying a wafer with a device surface facing downward by an arm and making a surface of a wafer stage itself face downward. In Kawamura, an air shower 13 for blowing off dust is utilized, in order to remove defects from the downwards-facing surface of the wafer.

Like Ninomiya, Kawamura places a substrate in a downwards-facing direction for a much different purpose than the present invention and Morishige and Yoshino. Kawamura's system is directed to the removal of dust particles from the surface of the wafer, and is not concerned with particles that are produced while irradiating laser light onto a wafer.

Accordingly, like Ninomiya, one of ordinary skill in the art would not be motivated to utilize the teachings of Kawamura with those of Morishige and Yoshino, and thus claim 6 is patentable over the cited art of record, even when taking Kawamura into consideration.

Conclusion:

Since the combination of Morishige and Yoshino does not teach or suggest the placement of a substrate in a downwards-facing direction by way

of a holder, and since neither the system/method of Ninomiya nor the system/method of Kawamura is combinable with the combined system/method of Morishige and Yoshino for the reasons stated above, claim 6 is patentable over the cited art of record.

B. Claim 13

Claim 13 depends from claim 6, and recites that the gas window is provided beneath the surface of the substrate and blows the material gas upwards towards the surface of the substrate.

While Morishige discloses a gas window, that gas window is disposed above the surface of the substrate.

While both Ninomiya and Kawamura disclose a downwards-facing substrate, their systems/methods are for entirely different purposes as the one disclosed in Morishige; namely, they are not directed to correcting defects due to irradiating laser light onto a surface of the substrate. Accordingly, one skilled in the art would not be motivated to change the location of the gas window of Morishige from being above the substrate, to being below the substrate, since the defects being corrected by Morishige are much different from the defects being corrected by both Ninomiya and Kawamura.

Accordingly, claim 13 is patentable for the reasons given above with respect to claim 6, as well as for the reasons given in this section.

C. Claims 15 and 20:

Claim 15 depends from claim 14, and so the same reasons given above with respect to claim 6 apply equally as well to claim 15. Claim 20 depends from claim 15.



Claim 15 recites that the gas window comprises a round groove and a laser irradiating hole. The round groove can be seen best as element 23 in Figure 2 of the drawings, and the laser irradiating hole can be seen best as element 25 in Figure 2 of the drawings.

As specifically recited in claim 15, the round groove is provided directly beneath the conical-shaped upper window. The advantages of having a round groove in the gas window are described on page 8, lines 17-23 of the specification.

Morishige:

The final Office Action relied on the teachings of Morishige to show the features recited in claim 15; however, this reliance was incorrect. In particular, Drawing 1 of Morishige shows a gas window with a laser irradiating hole; however, it fails to disclose or suggest a round groove provided directly beneath the conical-shaped upper window.

Accordingly, since none of the other cited art of record rectifies these shortcomings of Morishige, claim 15 is patentable over the cited art of record for this additional reason.

D. Claim 16

Claim 16 recites details of the gas window, as seen best in Figure 2 of the drawings.

The gas window includes a first opening that is provided closer to the flat lower window than the laser irradiating hole, in which the first opening provides purge gas from the gas circulatory unit into the gas window. This feature can be seen by way of the right-sided portion of the purge gas opening 21 in Figure 2 of the drawings.

Claim 16 also recites a second opening provided closer to the laser irradiating hole than the flat lower window, in which the second opening provides material gas into the gas window. This feature can be seen by way of the left-sided portion of the material gas supply opening 22 in Figure 2, whereby it is positioned against one side of the laser irradiating hole 25.

Claim 16 further recites a third opening provided adjacent one end of the round groove, in which the third opening sucks the purge gas out of the gas window. This feature can be seen by way of the left-sided portion of suction pipe 24 in Figure 2 of the drawings.

Morishige:

The final Office Action relied on Morishige to show all of the features of claim 16. In Morishige, unlike the disposition of the second opening as recited in claim 16, a material gas inlet 2 is provided closer to the flat lower window than to the laser irradiating hole. Also, in Morishige, unlike the disposition of the third opening as recited in claim 16, a purge gas inlet 1 is not provided adjacent to a round groove (as mentioned with respect to claim 15, there does not even appear to be a round groove in the gas window of Morishige). Morishige's suction gas outlets 4 are provided as circular holes in the middle of the top portion of his gas window.

Thus, as is clear from the discussion above, the structure recited in claim 16 is much different from the structure disclosed by Morishige. Accordingly, the invention as recited in claim 16 is not an obvious modification of the structure disclosed by Morishige. For example, the advantages discussed on page 15, lines 12-19 of the specification are not achieved by the gas window of Morishige, thereby adding further proof that

the gas window features of claim 16 are not merely a design choice with respect to the gas window features disclosed in Morishige.

E. Claim 17

Claim 17 depends from claim 16, and so the comments provided above with respect to claim 16 apply equally as well to claim 17. Also, claim 17 is patentable for the specific features recited in that claim.

Claim 17 recites that the first and second openings are provided on opposite sides of the gas window. See, in particular, the disposition of purge gas nozzle 21 and suction pipe 24 in Figure 2 of the drawings.

Morishige:

In Morishige, unlike the features recited in claim 17, the openings of material gas entrance 2 and denial gas inlet 1 are provided on a same side (the left side) of Morishige's gas window.

This difference is not merely a design choice, but rather a conscious decision to provide for a better gas window. Accordingly, the features recited in claim 17 are not taught or suggested by Morishige.

F. Claim 18

Claim 18 depends from claim 9, and so the comments provided above with respect to claim 6 apply equally as well to claim 18. Also, claim 18 is patentable for the specific features recited in that claim.

In particular, claim 18 recites that the sucking unit comprises a sucking mount, a groove fitted around an inside of the sucking mount underneath the

top cover, and an airtight rig embedded in the groove so as to maintain an airtight space between the sucking unit and the substrate.

Figure 3 of the drawings shows the features recited in claim 18.

Morishige:

The final Office Action relied on the teachings of Morishige to show the features of claim 18, but this assertion is incorrect. Rather, Morishige is directed to features of a gas window, whereby Morishige does not teach or suggest any features of a sucking unit. Accordingly, claim 18 is patentable for this additional reason.

G. Claim 19

Claim 19 depends from claim 18, and so the comments provided above with respect to claim 18 apply equally as well to claim 19. Also, claim 19 is patentable for the specific features recited in that claim.

In particular, claim 19 recites a pump, a pressure sensor, and a tube connecting the pump and the pressure sensor. Claim 19 also recites that the sucking unit comprises an opening for receiving the tube, in which the pump sucks out the air in a space between the sucking unit and the substrate, in order to adhere the sucking unit to the substrate.

Morishige:

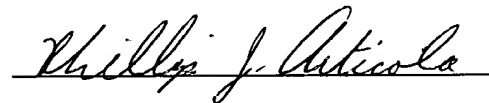
The final Office Action relied on the teachings of Morishige to show the features of claim 19, but this assertion is incorrect. Rather, Morishige is directed to features of a gas window, whereby Morishige does not teach or suggest any features of a sucking unit. A review of Kawamura, which does

show a sucking unit, does not show the explicit features recited in claim 19. Accordingly, claim 19 is patentable for this additional reason.

## 8. Summary

For the foregoing reasons, it is submitted that the Examiner's rejections are erroneous, and reversal of the applied rejections is respectfully requested.

Respectfully submitted,



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**10. Appendix:**

**Presently Pending Claims:**

1. (Previously Presented - Withdrawn) A method of correcting defects of pattern film on a surface of a substrate, comprising the steps of:  
holding the substrate with the surface facing downward;  
blowing, by way of a gas window in a direction towards the surface of the substrate, material gas for forming pattern film to the surface; and  
irradiating laser light upward at a white defect on the surface to form pattern film over the white defect.

2. (Withdrawn) The method claimed in claim 1, further comprising the steps of:  
irradiating laser light upward at a black defect on the surface; and  
vaporizing unnecessary part of pattern film in order to correct the black defect.

3. (Withdrawn) The method claimed in claim 1, further comprising the steps of:  
blowing oxygen gas to the surface;  
irradiating first laser light upward to unnecessary part of pattern film on the surface in order to oxidize the top layer of the part;  
irradiating second laser light upward to the oxidized top layer in order to peel the oxidized top layer off; and  
repeating the steps of irradiating first and second laser light in order to eliminate the unnecessary part of pattern film.

4. (Withdrawn) The method claimed in claim 1, wherein:  
the step of blowing further blows purge gas, which prevents a window

for conducting laser light from clouding, and carrier gas, which is included in CVD gas for carrying material gas; and

the main component of the purge and carrier gases is helium gas.

5. (Withdrawn) The method claimed in claim 1, wherein the substrate is sucked in order to be held at the step of holding.

6. (Previously Presented) A device for correcting defects of pattern film on a surface of a substrate, comprising:

a holder for holding the substrate with the surface facing downward;

a laser irradiator for irradiating laser light upward at a white defect on the surface; and

a gas window for blowing material gas on the surface and conducting laser light from the laser irradiator through the gas window to the white defect in order to form pattern film over the white defect,

wherein the laser irradiator comprises a first laser source for irradiating first laser light for vaporizing pattern film, and a second laser source for irradiating second laser light for laser CVD..

7. (Original) The device claimed in claim 6, further comprising an optical unit for observing pattern film on the substrate.

8. (Previously Presented) The device claimed in claim 7, wherein the substrate is permeable to light, further comprising a penetrating light source for irradiating light through the substrate to the lower surface of the substrate in order to illuminate the lower surface.

9. (Previously Presented) The device claimed in claim 8, further comprising:

a sucking unit having a top cover permeable to light;

wherein the penetrating light source comprises a lens that is designed to compensate the distortion of the lens with reference to a total thickness of the cover and the substrate.

10. (Previously Presented) The device claimed in claim 6, wherein the first laser light is irradiated through the gas window at black defects in order to vaporize the black defects; and

the second laser light is irradiated through the gas window at white defects with material gas in order to form film over the white defects.

11. (Previously Presented) The device claimed in claim 6, wherein:

the gas window blows purge gas, which prevents a window for conducting laser light from clouding, and carrier gas, which is included in CVD gas for carrying material gas; and

a main component of the purge and carrier gases is helium gas.

12. (Original) The device claimed in claim 6, wherein the holder sucks the substrate in order to hold the substrate.

13. (Previously Presented) The device claimed in claim 6, wherein the gas window is provided beneath the substrate and blows the material gas upwards towards the surface of the substrate.

14. (Previously Presented) The device claimed in claim 7, further comprising:



an object lens provided between the gas window and the optical unit,  
wherein the gas window comprises:

- a flat lower window for receiving laser light through the object lens;
- a conical-shaped upper window,

wherein a conical-shaped cavity is provided between the flat lower window and the conical-shaped upper window.

15. (Previously Presented) The device claimed in claim 14, wherein the gas window further comprises:

- a round groove provided directly beneath the conical-shaped upper window; and

- a laser irradiating hole provided between the round groove and the flat lower window.

16. (Previously Presented) The device claimed in claim 15, further comprising:

- a gas circulatory unit for providing gases to the gas window,  
wherein the gas window comprises:

- a first opening provided closer to the flat lower window than the laser irradiating hole, the first opening providing purge gas from the gas circulatory unit into the gas window;

- a second opening provided closer to the laser irradiating hole than the flat lower window, the second opening providing material gas from the gas circulatory unit into the gas window; and

- a third opening provided adjacent to the round groove, the third opening sucking the purge gas out of the gas window.

17. (Previously Presented) The device claimed in claim 16, wherein

the first and second openings are provided on opposite sides of the gas window.

18. (Previously Presented) The device claimed in claim 9, wherein the sucking unit comprises:

a sucking mount; and

a groove fitted around an inside of the sucking mount underneath the top cover; and

an airtight ring embedded in the groove so as to maintain an airtight space between the sucking unit and the substrate.

19. (Currently Amended) The device claimed in claim 18, further comprising:

a pump;

a pressure sensor; and

a tube connecting the pump and the pressure sensor,

wherein the sucking unit further comprises:

an opening for receiving the tube,

wherein the pump sucks out air in a space between the sucking unit and the substrate, in order to adhere the sucking unit to the substrate.

20. (Previously Presented) The device claimed in claim 15, wherein the laser irradiating hole is smaller in size than the flat lower window.